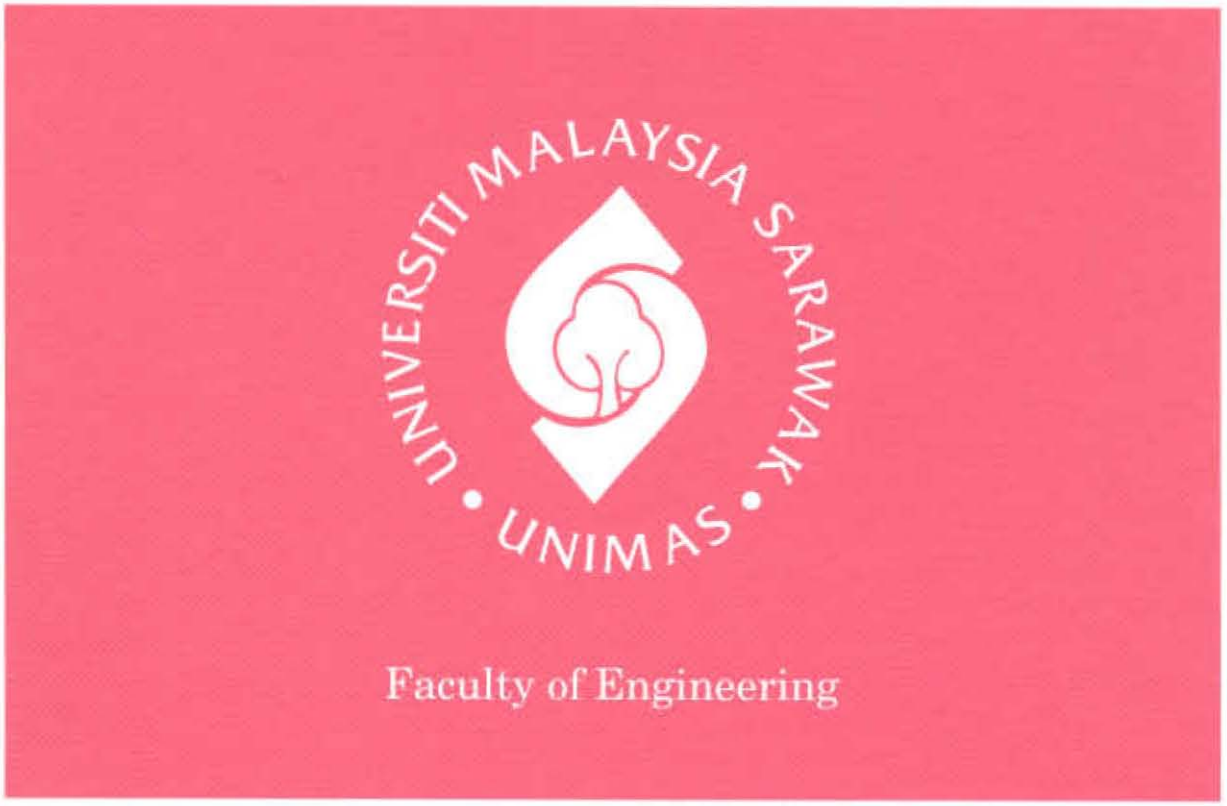

THE INFLUENCE OF SPEED TABLES ON URBAN ARTERIAL ROAD: A CASE STUDY IN PADUNGAN STREET, KUCHING CITY

Suhaida Binti Sulong

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THE INFLUENCE OF SPEED TABLES ON URBAN ARTERIAL ROAD: A CASE STUDY IN PADUNGAN STREET, KUCHING CITY

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To my beloved parent, near relative brothers and sisters, friends and special for someone in my heart.

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ABSTRACT

Over-speeding and reckless driving are important factors contributing to traffic accidents, which sometimes result in the loss of lives and damage to property especially in congested urban arterial roads. Because of the potential problem caused by excessive vehicle speeds in these areas, physical traffic calming devices were introduced to reduce the speed of vehicles effectively. This project is a research on the influence of speed tables on Padungan Road, Kuching City. The objectives of the projects are to evaluate the effect of the speed tables on vehicle speeds, to determine the relationship between spacing of humps and vehicle speeds area and to get the influence factors to vehicle speeds at speed table's area. Generally, this project was conducted in two main steps, namely traffic volume studies and spot speed studies. Analyzed data from volume studies was then used to determine the minimum sample size required for further used in spot speed studies. In order to get the spot speed data, three different locations along the road site were chosen, namely at post entry of first speed table for direction to the right and left and in between of second and third speed table. Based on the data analysis, a series of three speed tables, which installed on Padungan Road are function to reduce traffic speeds. The speed changes of 5.5 kph (to the left direction) compared to 2.2 kph (to the right direction) and 4.3 kph (to the left direction) compared to 2.2 kph (to the right) direction in 85^{th} percentile speed and average speed respectively indicate that the speed tables which installed on roadway direction to the left are more effective at reducing vehicle speeds. As shown by the regression model generated, the vehicle speeds would also decreased as the post entry distance decreased from 80 m to 45 m and lastly to 15 m. However, the observation shows that the vehicle speeds reduction were influenced by other restraint factors such as the effect of high traffic volume, small lane width, the existence of on-street parking and even double on-street parking, big divider with big trees along and also the use of the speed tables as pedestrians crossing way.

ABSTRAK

Memandu melebihi had laju dan kecuaian adalah faktor-faktor penting penyumbang kepada kemalangan jalanraya, yang mana kadangkala menyebabkan kehilangan nyawa dan kemusnahan harta benda terutamanya di jalanraya utama yang sesak. Disebabkan masalah yang timbul akibat pemanduan melebihi had laju di kawasan-kawasan ini, alat fizikal kawalan lalulintas diperkenalkan untuk mengurangkan kelajuan kenderaan secara efektif. Projek ini merupakan satu kajian terhadap pengaruh 'speed tables' di Jalan Padungan, Bandaraya Kuching. Matlamat projek ini adalah untuk menilai kesan 'speed tables' terhadap kelajuan kenderaan, untuk menentukan hubungkait antara jarak dan kelajuan kenderaan dan untuk mengenalpasti faktor-faktor yang mempengaruhi kelajuan kenderaan di kawasan kajian. Secara umumnya, projek ini dijalankan menggunakan dua kaedah utama, iaitu kajian isipadu lalulintas dan kajian pengukuran laju jurusan lalulintas. Data yang dianalisis daripada isipadu lalulintas kemudiannya digunakan untuk menentukan saiz sampel minimum yang diperlukan untuk digunakan seterusnya dalam kajian pengukuran laju jurusan lalulintas. Tiga lokasi yang berbeza sepanjang Jalan Padungan telah dipilih bagi mendapatkan data kelajuan iaitu ketika memasuki 'speed table' yang pertama untuk arah jalan menghala ke kanan dan ke kiri dan di antara 'speed table' kedua dan ketiga. Berdasarkan analisis data, didapati rangkaian tiga 'speed tables' yang ditempatkan di Jalan Padungan berfungsi dalam mengurangkan kelajuan kenderaan. Perubahan kelajuan daripada 5.5 km/j (arah menghala ke kiri) dibandingkan dengan 2.2 km/j (arah menghala ke kanan) dan 4.3 km/j (arah menghala ke kiri) dibandingkan dengan 2.2 km/j (arah menghala ke kanan) bagi 85 peratus kekerapan kelajuan dan purata laju masing-masing menandakan bahawa 'speed tables' yang ditempatkan di jalan menghala ke kiri adalah lebih efektif dalam mengurangkan kelajuan kenderaan. Seperti yang ditunjukkan melalui model regresi, kelajuan kanderaan akan turut berkurangan selari dengan pengurangan jarak yang dilalui daripada 80 m kepada 45 m dan seterusnya kepada 15 m. Walau bagaimanapun, pemerhatian menunjukkan bahawa pengurangan kelajuan kenderaan juga turut dipengaruhi olef faktor-faktor lain seperti isipadu lalulintas yang tingi, kelebaran jalan, kewujudan tempat meletak kenderaan di bahu-bahu jalan dan malahan meletak kenderaan secara dua baris, pembahagi jalan yang besar dengan pokok-pokok yang besar ditanam sepanjang pembahagi jalan tersebut serta penggunaan 'speed table' sebagai jalan lintasan bagi pejalan-pejalan kaki.

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LIST OF SYMBOLS

E	-	Permitted error in the average speed estimate, mph
K	-	Constant corresponding to the desired confidence level
N	-	Number of vehicles whose spot speeds were observed
N	-	Minimum number or measured speeds
S	-	Estimated sample standard deviation, mph
U	-	Constant corresponding to the desired percentile speed
H_s	-	Optimal spacing between 3" humps (ft)
u_i	-	Spot speed of i^{th} vehicle
$\bar{u}_t$	-	Average time-mean speed
V_{85}	-	The desired 85th percentile speed (mph) between humps

CHAPTER 1

INTRODUCTION

1.0 Background

As a capital of Sarawak State, Kuching City becomes a road centre and chief port for the western coast of Borneo. Today, the city has around 496,000 inhabitants. Because of the huge areas and high number of inhabitants in this city, the government has provided enough total length of road system to cover for the whole areas. Tabuan Road, Padungan Road, Mc Dougall Road, Green Hill Road, A. Ramlee Road, Barrack Road and Central Road are some examples of urban arterial roads that can be found in the city.

Most of the roads were completed with certain type of physical traffic calming to ensure clear traffic flows and at the same time to avoid of accidents. Among the usual traffic calming placed at the roads are traffic light, stop sign, speed bump, speed table, speed hump, raised crosswalk, speed limit sign and so on.

1.1 Urban Arterial Road

This class of road forms a primary network for the urban area as a whole. All long distance traffic movements to, from and within the city should be focused onto such roads. The roads are high in volumes, restricted access, and fairly high speeds included face an increasing number of serious problems like high accident rates.

Slower-than-desired travel speeds, increased and unpredictable travel times, increased accidents frequencies, erratic stop-and-go driving and other undesirable conditions resulting in user dissatisfaction are the major operational problem on urban arterial roads (Homburger et al, 1989).

Because of the potential problem caused by excessive vehicle speeds in urban areas, remedial measures have been implemented by introducing traffic calming devices to reduce the speed of vehicles effectively.

1.2 Introduction to Traffic Calming

Definition of traffic calming is varies. According to Institute of Transportation Engineers (ITE), the term 'traffic calming' is often describes as the combination of mainly physical measures that reduce the negative effects of vehicle use and improve conditions for nonmotorized road users. The term 'traffic calming' also applies to a number of transportation techniques developed to educate the public and provide awareness to unsafe driver behaviour.

In another part, traffic calming is a set of road design and traffic rules that slow and reduces traffic while encouraging walkers and cyclists to share the road. The devices are simple, inexpensive, self-enforcing, and easily modified to accommodate emergency vehicles, garbage trucks, and buses. Traffic calming affords to reduce traffic accidents, increases the safety and convenience for pedestrians and other non-motorists, gives more space for children to play, eliminates noise and pollution, improves scenery, provides neighbourhood revitalization and stability, and reduces crime. Basically, general objectives of traffic calming are:

i) To reduce vehicle speeds

ii) To fewer traffic accidents

iii) To promote safe and pleasant conditions for motorists, bicyclists, pedestrians and residents

iv) Neighbourhood revitalization and stability

v) To improve real and perceived safety for non-motorized users of the roads.

Nowadays, there are various types of traffic calming devices introduced in order to reduce vehicle speeds such as speed humps, speed bumps, speed tables, raised intersections, rumble strips and many more. It is important to understand the features and the purpose of various traffic calming devices, especially speed tables, which will be discussed as a detail in the next chapter.

1.2.1 Speed Humps

Speed hump is a low ridge that across a road and it is designed for the primary purpose of reducing speed. They are raised areas in the pavement surface extending transversely across the travel way. Originally developed in early 1970s in Great Britain, speed humps can be constructed of a number of materials including asphalts, concrete, brick and recycled rubber.

Speed humps are self-enforcing and often called 'sleeping police officers' or pavement undulations. This traffic calming devices are good for locations where very slow speed are desired and reasonable, and noise and fumes are not major concern.

1.2.2 Speed Bumps

"A speed bump is one of these nasty things you get at the back of shopping centres. It may be a foot wide and about 15 inches tall. When you hit it, you really feel it", explained Dr. John Braaksma, Professor of Civil Engineering at Carleton.

Normally, speed bumps are 3-4 inches (0.08-0.10m) high and 1-3 feet (0.31-0.9m) long and have typically been used in parking lots and on private roads. Same as speed humps, speed bumps used to reduce vehicle speeds. To pass over speed bumps without doing damage to the vehicle or causing discomfort, the driver must slow down almost to a complete stop. Passing diminishes the effects of speed bumps over them at excessive speeds in a vehicle with loose suspension.

1.2.3 Raised Intersections

A raised intersection is analogous to a midblock speed hump as a speed reduction technique. The entire intersection is raised a few inches above the normal grade level, with ramps to conform to the grades of the adjacent roads.

This device has been employed extensively in Europe. In United State, it is generally installed as pedestrian safety or convenience measures on shopping roads rather than as a neighbourhood traffic control.

1.2.4 Rumble Strips

Rumble strips were developed in the 1960s as a means for alerting drivers to the presence of a dangerous condition or a specific control device. It is designed as a patterned section of rough pavement. While used primarily on freeway and major roads, they may have been used as a speed reduction device in neighbourhood

1.2.5 Speed Tables

Speed tables are flat-topped speed humps often constructed with brick or other textured materials on the flat section. Speed tables are typically long enough for the entire wheelbase of a passenger car to rest on the flat section. Their long flat fields, plus ramps that are sometimes more gently sloped than speed humps, give speed tables higher design

speeds than speed humps. The brick or other textured materials improve the appearance of speed tables, draw attention to them, and may enhance safety and speed-reduction.

This device is good for locations where low speeds are desired but a somewhat smooth ride is needed for larger vehicles. They are smoother on large vehicles (such as fire trucks) than speed humps; and they are effective in reducing speeds, though not to the extent of speed humps.

1.3 Objectives of the Study

This study was aimed to evaluate the effect of a series of speed tables on vehicle speeds and to determine the relationship between spacing of the humps and vehicle speed in road of selected. Specific objectives of this study include the followings:

i) To get vehicle speed data at speed tables area by using Radar Gun.

ii) To get influence factors to vehicle speeds at speed tables area.

iii) To develop a simple model using Regression Modelling.

1.4 Scopes and Limitation

This study was limited on the analysis of speed selection of isolated vehicles at speed tables area in relation to hump spacing at Padungan road. The effects of road geometry and intersection geometry were not included except hump spacing and design. Only speed tables having 10 m in length and spacing of 160 m were considered. Data collection was